Students' Patterns of Library Use Focusing on Information Search

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情報探索にみる学生の図書館利用のパターン

Abstract

　Information search behavior is deeply influenced by the individual's knowledge and skills, namely personal cognitive ability. This study focuses on individual students' information search activities in the process of library use.

　A survey of students inquiring their attributes and information search activities was conducted at the University of Colombo in 2007. The collected results of questions about twelve information incidents were put through factor analysis to reveal four factors and then cluster analysis based on the factor scores identified four student groups. Significant differences were found among each of the groups, which make up the students' patterns of library use. Subjects, academic years, frequency and purposes of library use further confirmed those differences. These patterns should be taken into consideration in designing library systems.

抄録

　情報探索行動は，個人的な知識やスキル，すなわち認知能力が深く関わっている。本研究は，図書館利用における個々の学生の情報探索活動に注目する。

　2007 年コロンボ大学において学生の属性と情報探索活動に関する調査を実施した。12 の情報に関わる出来事に関する回答を因子分析し 4 因子を得た。その因子スコアに基づいてクラスター分析を行ったところ，4 つの学生グループが抽出された。学生の図書館利用のパターンを構成する重要な相違がグループ間で見いだされた。学部や学年，図書館利用の頻度や目的でもこれらの相違がみられる。こうしたパターンは，図書館システムの設計において考慮されるべき点である。

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1．Introduction

1.1　Overview

An information search in a library is a process in which the searchers' primary cognitive ability in terms of knowledge and skill makes a deep impact on their success. The process is composed of a number of observable search activities such as "use of search tools," "sources selection," "locating devices," and "use of librarians' services." And the preference of search activities implies different patterns of library use. Understanding of students' cognitive ability concerning the knowledge and the skills of library use through such patterns might confirm their positions in the use of the library.

Libraries play a vital role towards the development of knowledge in universities. University students are increasingly directed to perform independent searches in specific areas of academic information. They have to make direct use of information rather than consulting with intermediaries. They may face challenges in searching for information within libraries due to insufficient knowledge and skill. Students with limited ability have poor outcomes compared to their peers with higher levels of ability. It is a drawback among students in achieving the required outcomes. Different users will receive different information from the same library setting according to their knowledge and skill. Therefore, well identified user patterns are a prerequisite for the development of libraries.

The knowledge and skill levels of students and their patterns of library use in the information search, which are the most important research aspects of this study, are two complementary concepts affecting many information incidents. If the library use demonstrates different patterns from one individual to another, it necessitates offering different types of service depending on their levels of knowledge and skill.

From the above mentioned issue, several questions arise: Do the students have different patterns of library use in the process of their information searches? If so, what is the state of the users like in the search process? To answer these questions, this research evaluated twelve functional aspects of a university library in the process of information searching by using a sample selected from the University of Colombo－Sri Lanka.

Studying the different attributes of the users will help us to understand their constructive ability in thinking, understanding, learning, and other mental phenomena during the process. Two students may be identical just as one may be different in the same process. This can be caused by different levels of knowledge and skill which facilitate them to take different preferences. Studying such differences is of practical importance in organizing library services.

1.2　Related Studies

In the last few decades, many scholars have identified the affecting variables of the search patterns of library users in many ways and discussed diversities of behavior. They considered the information search from the users' point of view. As a result, many models and theories were discovered. Some have looked at this process mainly through behavioral aspects（e.g. Ellis, 1989 & 1993; Ellis, Cox & Hall, 1993）and cognitive aspects（e.g. Kuhlthau, 1991）. In addition, to obtain better understanding about users' information behavior, the socio and cultural context were also taken into consideration（e.g. Capurro, 1992; Miska, 1992; Vakkari, 1994）. Some scholars have pointed out that to understand the users' perspectives clearly, it is necessary to study both the cognitive view point and the socio－cultural context as a whole（e.g. Savolainen, 1995; Wilson, 1981）.

In this paper, we assumed that the users in the search process are encouraged or discouraged more by the levels of knowledge and skills than by any other affecting variables－"Individuals differ in their general skills, aptitudes, and preferences for information"（Jonassen & Grabowsky, 1993）.

For information searching, there is a need for active functioning of cognition. A number of scholars have revealed cognition to be an affecting variable of the user patterns in the information search through different angles such as gaps of knowledge（Allen, 1996）, stress（Wilson, 1981-2000）, anomaly status of knowledge（Atkins, 1973）, uncertainty（Kuhlthau, 1991）, knowledge surrogate（Farradene, 1976）, sense maker（Dervin, 1986 & 1992）antecedent factors（Johnson, 1997）, and answers to questions（Taylor, 1968）.

We assumed the different search patterns may occur due to a variety of knowledge and skill levels. Hence, the term "cognition" used in this article refers specially to

the primary knowledge and skill characteristics of the individuals（assuming these two indications are involved in creating different patterns in the library search process）.

2．Research Issue and Methodology

2.1　Objectives of the Study

The aim of this study is to investigate students' library use on the basis of two cognitive measurements（knowledge and skills）in the information search process and how students' information behaviors are affected by those characteristics, mindful of the identification of the students' concerns. This kind of investigation often begins with an assumption of diversity of user patterns and verifies it with the user community. This paper also explores their patterns of library use as regards the students' cognition and clarifies whether it represents a unique pattern in the process of library use. For these purposes, we have addressed the following two research questions:

　１．How do students' library searches differ across twelve information incidents on the basis of two distinguishable elements（knowledge and skills）? Do different patterns of use exist?

　２．If different patterns exist, do subjects, academic years, frequency, and purposes of their library visits affect those patterns?

A few hypotheses were framed in the null form: there are no significant differences in the information search patterns depending on subjects（medicine or art）that the students are learning. There are no significant differences in the information behavior in the information search process of students on the basis of their knowledge and skill levels. There are no significant user patterns among undergraduates. It seems to be identical.

2.2　Survey Instrument and Conceptual Framework

A self-administered questionnaire which included twelve information incidents was presented to gauge personal perception and attitude－"Survey research is generally considered to be more appropriate for studying personal factors and for exploratory analysis of relationship"（Powell, 2004）. We applied the survey method to our study population to collect their opinions. The questionnaire was constructed according to the two cognitive elements（knowledge and skills）as the basis of this study.

Primary Cognitive Elements
Knowledge

Knowledge is the interpersonal understanding or self schema about the self that is derived from past experience. It always organizes and guides people. The knowledge represents the individual's direct experience and it will actively construct the seeking process. In a sense, the knowledge can be identified by evaluating the level of understanding in the information search process. The term "knowledge" refers to understanding needed－getting known through experience.

Skill

Even though the user has knowledge, a series of functional user skills must be identified. These include logical skills, communication skills, and technical skills needed to handle, negotiate, compile, organize, sort, abridge, evaluate, and analyze the available information. The aspect of a skill seems to be under the control of cognitive conditions（Stillings, 1995）. It directly increases or decreases the information search ability of the user. The term "skill" refers to the ability to manipulate information.

Conceptual Formwork and Twelve Information Incidents in Library Use

For this study, we considered that those two basic elements of information seekers' make differences on their library use. Knowledge and skill elements indicate the users' practices that have an impact on how library is used and information perceived. On the basis of these two indications, we prepared a conceptual framework with twelve information incidents classified into five basic capabilities in a general library use.

Each information incident prior to library use as the coding schema in this paper is how and to what extent the students' primary cognitive elements（knowledge and skill）relate with starting a search（whether the searchers are goal-directed, and their efficacy in using library search tools）, resource selections（awareness of current tools and way of selecting documents）, use of library service and system（familiarity with the library service system and utilizing assistance services）, locating the information and the materials according to four distinctive incidents due to its wider usage（navigational ability of both materials and information, patterns of discovering the materials and

awareness of the library layouts), and evaluation of the self (whether the experiences increase the search capability and image of total retrieval capability) as shown in Table 1.

As the main part of our conceptual framework, five stages are characterized by twelve activities that are very vital to understand the users' perceptions and attitudes in a library use process. They focused on cognition and its effects on library use. The findings may help to identify the factors hindering undergraduates from using their libraries effectively and efficiently. An assessment of perceptions and attitudes was designed according to the Likert scale using a seven-point graphic rating by allowing the respondents to select any point along a line. Each of the agreements was given a certain value starting from "strongly agree" (point 7) through to "strongly disagree" (point 1). In the case of negative questions, certain values indicated "strongly agree" (point 1) through to "strongly disagree" (point 7).

2.3　The Population, Sample and Data Collection

The targeted population selected for the survey included all the undergraduate students at the Faculty of Medicine and the Faculty of Art at the University of Colombo-Sri Lanka in January 2007. The University of Colombo is the metropolitan university of Sri Lanka. The academic structure includes seven faculties which offer nearly thirty-five departments and several extension courses. The faculties are Art, Law, Education, Management and Finance, Medicine, Science, and Graduate Studies. The two faculties used in this study seem to have different learning aspects. Art students follow a group of academic disciplines that studies the human aspects of the world such as Demography, Economics, Geography, History and International Relations, Political and Public Policy, Languages, and Sociology, where as the curriculum of the Faculty of Medicine is structured around a group of inter-subjective or structural aspects of the human body and mind such as Anatomy, Biochemistry, Clinical Medicine, Community Medicine,

Table 1　Design and Definitions of the Research Variables

Coding schema	Perceptions	Addressed search activities in the library use
Starting a search	1. Information needs situation	I start information seeking in the library with exact and steady ideas of my information needs.
	2. Efficacy of library search	I can understand the use of information search tools in the library to find out my needs.
Resources/ Tools selections	3. Awareness of current tools	I do not know how to use electronic instruments available in the library.
	4.Way of selecting resources	Most of my searches are author and the title of a book.
Use of library service & system	5. Familiarity with the library services	(Inter-Library Loan Service, Current Awareness Services, and Selective Dissemination of Information) I know the above services are available in my library.
	6. Utilizing of assistance service	I have never had any negotiation with the librarian when I had an information problem.
Locating the information and the materials	7. Navigational ability to materials	The links between the catalog and the book shelves are complicated. I am unable to find books on shelves as indicated by the catalog.
	8. Patterns of discovering materials	Most of my information was found accidentally / by chance (Casual browsing).
	9. Understanding of system layouts	My understanding of the physical arrangements of the library is satisfactory.
	10. Navigational ability to information	Bibliographies, references, indexes, abstracts are not useful for me when gathering information from the documents I have found.
Self evaluation	11. Personal knowledge received by the search experiences	Each of the searches increased my knowledge in access to information searching.
	12. Evaluation of the self	I know the library has additional information, but I don't have the ability to find everything that I want.

Question numbers 3,6,7,10,12 were in negative form.

Microbiology, Gynecology, Pediatrics, Pathology, Pharmacology, Physiology, Psychological Medicine, and Surgery. This difference in learning areas may affect the students' patterns of library use.

A random sampling technique was used and students were selected in terms of academic years. Since there was a large study population, the sample size was restricted to 15% of the total population in both faculties. Out of the total population of the Faculty of Medicine（981）, 15%（147） of the students were selected for the sample, and 87%（128） responded. Out of the total student population（1067） of the Faculty of Art, 15%（160） were selected for the survey, and 78%（126） responded（Table 2）.

3．Data Analysis and Results

3.1 Factoring the Twelve Incidents（Primary Cognitive Ability）

The twelve information incidents that explain the students' primary cognitive ability in a general library search process were analyzed using a principal component technique by rotating with oblique（Promax）, creating four latent factors, as shown in Table 3. A Kaiser-Meyer-Olkin test（0.57） confirmed the validity of the factor results.

The factor "Method of Locating & Searching" extracted four incidents whilst three shared incidents represented by the factors of "Use of Materials & Services" and "Own

Table 2 Population, Sample, and Responses Rates According to Faculties and Academic years

Faculty	Academic years														
	1st year			2nd year			3rd year			4th Year			5th year		
	P	S	R	P	S	R	P	S	R	P	S	R	P	S	R
Art	344	52	37	225	34	26	235	35	30	263	39	33	-	-	-
Medical	193	29	26	194	29	24	194	29	28	200	30	26	200	30	24
Total	537	81	63	419	63	50	429	64	58	463	69	59	200	30	24

Code: P= Population   S= Sample   R= Response   - Indicates non-existence of students
Population = 2048 (Art = 1067, Medical = 981), Sample = 307 (Art = 160, Medical = 147), Response rates = 254 (Art = 126, Medical = 128)

Table 3 Factor Analysis of Twelve Information Incidents in a Library Search

| Twelve Information incidents | Factors | | | |
	Method of Locating & Searching	Use of Materials & Services	Searching Needs	Own Competence
11. Each of the searches increased my knowledge in access to information. (Personal knowledge)	-.662	.156	.057	-.137
4. Most of my searches are author and the title of a book. (Way of selecting resources)	.598	.223	.361	.063
10. Bibliographies, references, indexes, abstracts are not useful for me when gathering information from the documents I have found. (Navigational ability to information) *	.494	-.036	-.418	-.065
9. My understanding of the physical arrangements of the library is satisfactory. (Understanding of system layouts)	.436	-.281	.006	-.324
8. Most of my information was found accidentally / by chance (Casual browsing) (Patterns of discovering materials)	.317	-.623	.012	.117
3. I do not know how to use electronic instruments available in the library. (Awareness of current formats) *	.063	.584	-.090	.174
6. I have never had any negotiation with the librarian when I had an information problem.(Utilization of assistance services) *	-.047	.538	-.233	-.027
1. I start information seeking in the library with exact and steady ideas of my information needs. (Information needs situation)	-.043	-.194	.655	.073
2. I can understand the use of information search tools in the library to find out my information needs. (Efficacy of library search)	.027	-.093	.603	-.052
12. I know the library has additional information, but I don't have the ability to find everything that I want. (Evaluation of the self) *	.269	.124	-.111	.785
5. (Inter Library Loan, Current Awareness Services, and Selective Dissemination of Information) I know the above services are available in my library.(Familiarity with the library services)	.154	.109	-.238	-.584
7. The links between the catalog and the book shelves are complicated. I am unable to find books on shelves as indicated by the catalog. (Navigational ability to materials) *	-.211	-.266	-.243	.318

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
* indicates the questions in negative form.

Competence". The factor of "Searching Needs" extracted two incidents.

Factor one-In the factor of "Method of Locating & Searching," there was a negative and positive relation within the extracted four incidents. Impact of the search experience in accessing the information was negatively related with the "Method of Locating & Searching" factor. Though the experience did not provide sufficient knowledge for further searches, the other three incidents that express the preference of document selection, use of bibliographic information, and knowledge of the physical aspect of information arrangements were positively related. This may imply that users have their own search terms for documents searching and come to libraries with some ideas of needed documents. They have the ability to navigate for the information through bibliographic tools and are familiar with the physical aspects of the library. Factor two-Use of Materials & Services (attention to use of devices of information and utilization of assistance services), Factor three-Searching Needs (good awareness of one's need and library search tools) was extracted. Factor four-Own Competence also negatively related with the library use such as understanding library service delivery (ILL), whilst shortage and importance of overall ability to find information and understanding of the system links positively related with the factor of "Own Competence."

3.2 Grouping Students According to Their Library Use Patterns

The scores of the four factors of 254 undergraduates were put into the cluster analysis (Nonhierarchical k-means method), and four different groups were found as follows: The study examined how far undergraduates' cognitions behave within these four specific groups. Figure 1 represents the in-depth differences and concerns of the user groups within the four factors found through this study.

1) Group I: The first group found in this study of the information search process accounted for 20% (51) of the total number of original 254 respondents. They had high positive concern only in relation to Use of Materials & Services. The other three factors (Method of Locating & Searching, Searching Needs, and Own Competence) had negative scores.

2) Group II: The second group found in the cluster analysis accounted for 22% (57) of the respondents. They were positive in relation to all four factors. They were highly concerned with Searching Needs, Method of Locating & Searching, Use of Materials & Services, and their own competence respectively. They behaved as experts in the search process with a deeply positive attitude.

3) Group III: Twenty-two percent (57) of the respondents had a highly positive attitude only for Own
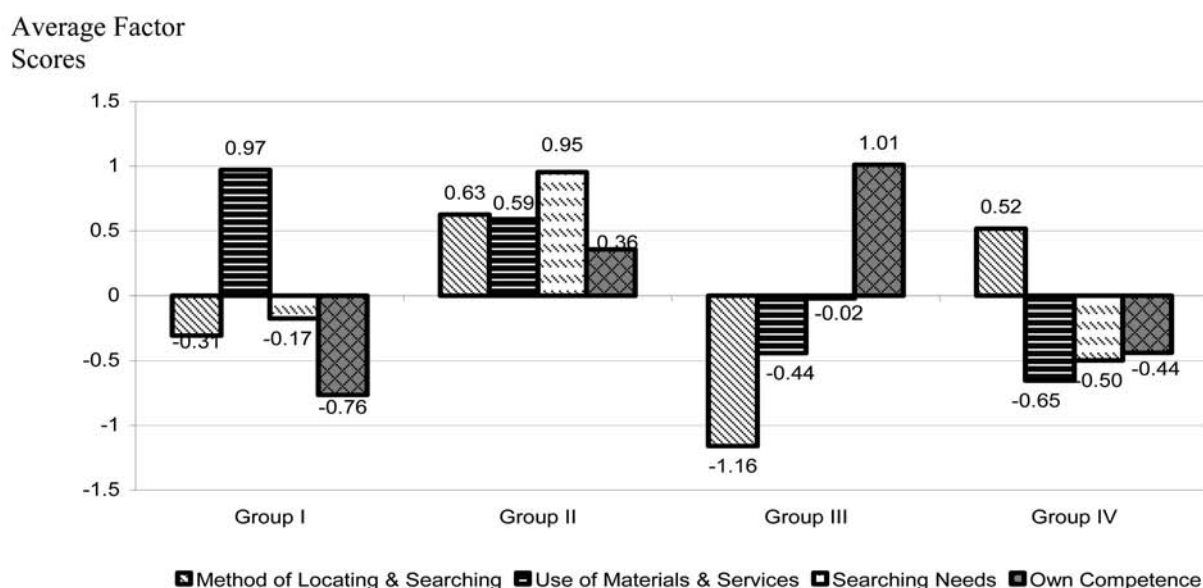

Figure 1　Descriptive Statistics of Library Use Patterns by the Four Clusters of User Groups

Competence. The other three factors (Method of Locating & Searching, Use of Materials & Services, and Searching Needs) all had negative scores.

4) Group IV: This was the largest of all the groups represented. Thirty-five percent (89) of the total respondents showed negative reaction toward Use of Materials & Services, Searching Needs, and Own Competence. They were positively concerned with Method of Locating & Searching in the search process. But it can be concluded that their negative concern for knowledge and skills of the other three factors hindered them to some extent in the process of information search.

Table 4 and Figure 2 present the mean scores of each incident by groups.

3.3 Groups' Patterns of Library Use According to Subjects and Academic Years

To examine the groups' patterns further, we cross-tabulated them to clarify the discrepancies between subjects and academic years to which they belong.

By Subjects

The discipline difference of Group I was 16% (21) in the Faculty of Medicine and 24% (30) (the majority) in the Faculty of Art. There is a similar representation in Group II of 23% (30) in the Faculty of Medicine and 21% (27) in the Faculty of Art. However, a huge discrepancy was indi-

Table 4　Mean Scores of the Twelve Information Incidents with the Four Factors and the Four Clusters of Groups

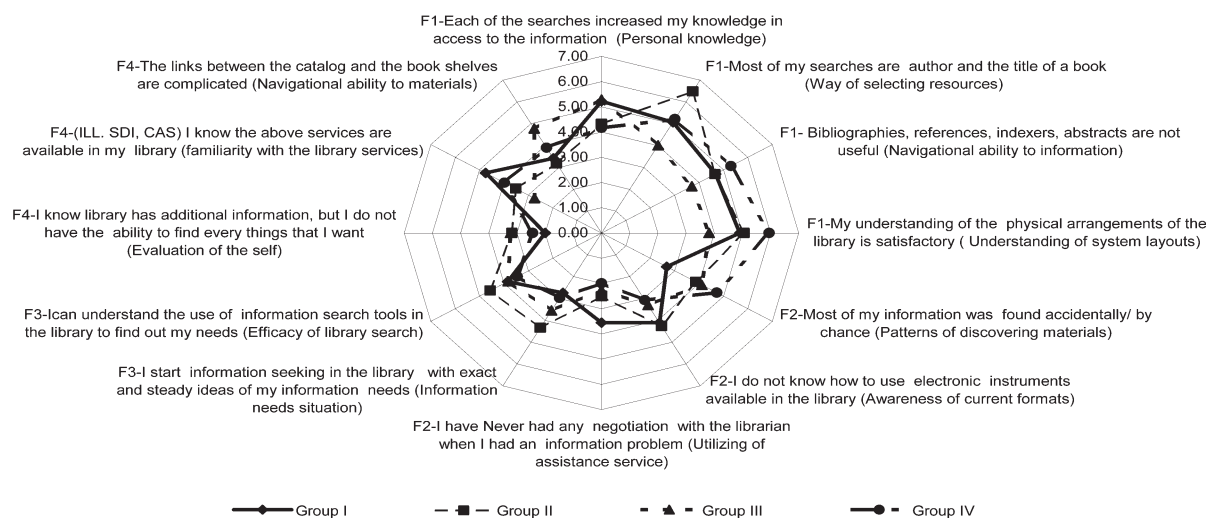| Factors	Twelve information incidents	Total respondents n=254											
		Group I			Group II			Group III			Group IV		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Method of Locating & Searching	Personal knowledge	51	5.22	1.06	57	4.32	1.21	57	5.28	1.14	89	4.16	1.21
	Way of selecting resources	51	5.06	1.43	57	6.47	0.82	57	4.00	1.45	89	5.20	1.56
	Navigational ability to information	51	4.67	1.27	57	4.65	1.42	57	3.70	1.51	89	5.30	1.27
	Understanding of system layouts	51	4.90	1.55	57	5.05	1.35	57	3.81	1.49	89	5.94	1.25
Use of Materials & Services	Patterns of discovering materials	51	2.67	1.39	57	3.86	1.34	57	4.11	1.33	89	4.72	1.27
	Awareness of current formats	51	4.10	1.28	57	4.25	1.35	57	3.30	1.23	89	3.07	1.04
	Utilizing of assistance services	51	3.55	1.83	57	2.51	1.59	57	2.26	1.43	89	1.99	1.22
Searching Needs	Information needs situation	51	2.73	1.35	57	4.33	1.49	57	3.54	1.79	89	2.97	1.57
	Efficacy of library search	51	3.84	1.40	57	4.56	1.23	57	3.82	1.22	89	3.45	1.18
Own Competence	Evaluation of the self	51	2.00	1.00	57	3.18	1.19	57	3.23	1.38	89	2.44	1.21
	Familiarity with the library services	51	4.75	1.09	57	3.51	1.24	57	2.72	1.32	89	3.97	1.46
	Navigational ability to materials	51	3.41	1.38	57	3.18	1.36	57	4.77	1.46	89	3.90	1.52

Figure 2　Mean Scores of the Twelve Information Incidents with the Four Factors and the Four Clusters of Groups

cated in Group III. The majority of them were medical students (37%[47]) and 8% (10) were art students. Group IV also indicated a significant difference. Most students came from the Faculty of Art (47% [59]) and 23% (30) were from Faculty of Medicine (Figure 3). The four groups had differing diversities in terms of the subjects they represented. (p＝0.000＜0.050 [chi-square])
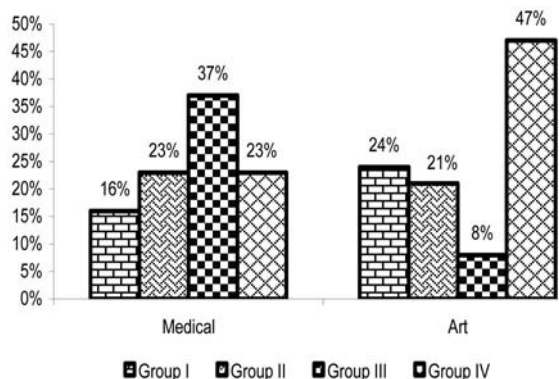

Figure 3　Average Users of Each Group

By Academic Years

We then verified whether the academic years of the students may have created differences among those groups. In the survey sheet, an open area was allocated to them to indicate their academic years. There are four academic years at the Faculty of Art and five academic years at the Faculty of Medicine.

In Group I, 24% (12) of respondents were first years, 24% (12) second years, 22% (11) third years, 22% (11) fourth years, and 10% (5) fifth years. In Group II, 33% (19) came from the third year, 25% (14) from the fourth year, 19% (11) from the second year, 12% (7) from the first year, and 11% (6) from the fifth year. In Group III, the majority were first years (44% [25]), and 19% (11) second years, 14%(8)the thied year 12% (7) fifth years, and 11% (6) fourth years. The majority of Group IV were fourth years (31% [28]), whilst 22% (20) came from the third year, 21% (19) from the first year, 18% (16) from the second year, and 7% (6) from the fifth year (Figure 4). The four groups had differing diversities in terms of academic years. (p＝0.012 ＜0.050 [chi-square]) In Figure 4 only medical students were included in the fifth year since there are only four academic years at the Faculty of Art.

When those patterns (academic years) were compared with the two subjects, it was further revealed that these students have differentiation according to the subjects
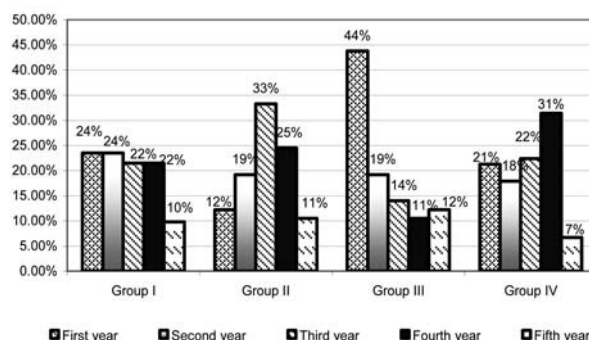

Figure 4　Numbers of Students by Academic Years in Each Group

which they represented. Among the medical students, third year students represented 38% (8) of Group I, whilst 24% (5) were fifth years, 19% (4) were second years, and 19% (4) were fourth years. There were no students who belonged to the first year in Group I. In Group II, the majority (27% [8]) were from the third year. Twenty-three percent (7) were second years, 20% (6) fourth years, 20% (6) fifth years, and 10% (3) first years students. Thirty-six per cent (17) (the majority of Group III) were first years, 21% (10) second years, 15% (7) third years, 15% (7) fifth years, and 13% (6) fourth years.

Meanwhile, the majority (33% [10]) of Group IV came from the fourth year, whilst 20% (6) from the fifth year, 20% (6) from the first year, 17% (5) from the third year, and 10% (3) from the second year (Figure 5). The four groups of medical students were diverse in terms of academic years (p＝0.035＜0.050 [chi-square]).

Among the art students, first year students represented 40% (12) of the Group I, followed by 27% (8) of second year students. Twenty-three percent (7) of the group were fourth years and 10% (3) were third year students. In Group II, the majority (41% [11]) were from the third year,
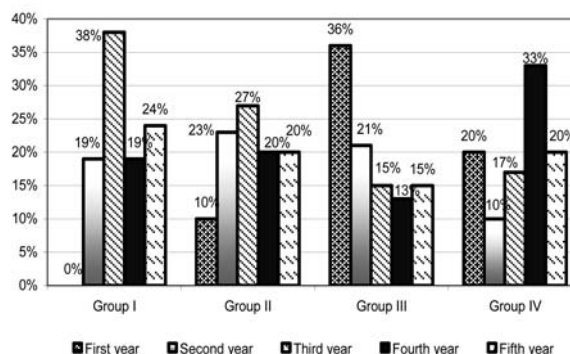

Figure 5　Numbers of Students by Academic Years in Each Group（Medicine）

30%（8）from the fourth year, 15%（4）from the second year, and 15%（4）from the first year. Eighty percent（8）of first year students, 10%（1）of second year students, and 10%（1）of third years were represented in Group III. In the Group IV, 31%（18）fourth year, 25%（15）third year, 22%（13）of second year and 22%（13）from first year were represented respectively. The four groups of art students also had diversities in terms of academic years（Figure 6）（p＝0.004＜0.050［Chi-square］）.
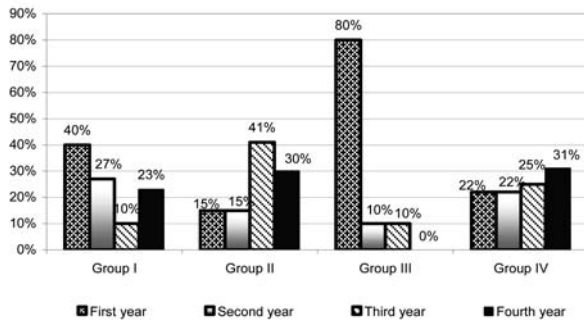

Figure 6　Number of Students by Academic Years in Each Group（Art）

3.4　Groups' Patterns According to the Frequency of Library Visits

Respondents were asked to indicate how often they visited the main or the faculty library of their university. Out of the six periods of time（1. every day, 2. 2-3 days per week, 3. once a week, 4. fortnightly, 5. once a month, 6. hardly ever）, respondents selected only four periods of time. The study found that 82%（208）of the respondents of all the groups visited the library almost daily or two or three times a week and confirmed that majorities were frequented users in all the groups.

Ninety-five percent（54）of Group III, despite their different behaviors in the search process, visited the library more than the other groups, whereas 5%（3）did not frequently visit. These were followed by Group I's frequent users（86%［44］）and rare users（14%［7］）, Group IV's frequent users（78%［69］）and rare users（22%［20］）, and Group II's frequent users（72%［41］）and rare users（28% ［16］）（Figure 7）. The calculated probability value of 0.041 ＜0.050 indicated that there is significant difference among the users in the four groups as regards their library visits.

A high degree of library visits was prominent among each of the groups. However, the probability value of 0.000 ＜0.050 indicated that there was a significant difference in
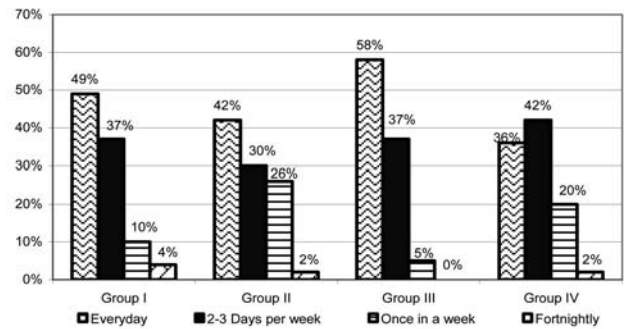

Figure 7　Frequency of Library Visits by Each Group

the frequency of library visits between the two disciplines. Medical students more regularly visited the library than did the art students. Ninety-three percent（119）of the medical students frequently visited the library; only 7%（9）were rare visitors. Seventy-one percent（89）of the art students frequently visited the library, whilst 29%（37）rarely visited it.

Frequencies of library visits by the identified four groups' behavior according to the two subjects were also significantly different. Among the medical students, 100% （21）of Group I and 98%（46）of the students of Group III, 93%（28）of the students of Group II, and 80%（24）of the students of Group IV frequently visited the library, whilst 20%（6）of the latter group did not.

Unlike the medical students, the arts students visit results indicated a different diversity. Only 77%（23）of Group I frequently visited the library, whilst 23%（7）rarely used it. Forty-eight percent（13）of Group II users regularly visited the library, whilst the majority（52%［14］）did not. Eighty percent（8）of Group III users often visited the library and 20%（2）did not. Of the Group IV users, 76%（45）often used the library and 24%（14）rarely did. The frequency of library visit by medical students was not identical among the four groups. This resulted in a probability value of 011＜0.050, which was significantly different at the .05 alpha levels with respect to the library visits. However, the visits of the four groups of art students were identical（p＝0.162＞0.050）. The medical students in each user group visited the library more frequently than the art students did.

3.5　Group's Patterns According to the Purposes of Library Visits

To identify the purposes of library visits, we offered eight purposes and respondents were asked to indicate the three

most important reasons for their library visits from the following: 1. for references, 2. to borrow books, 3. to read periodicals, 4. to check e-mails, 5. to use PC/Audio/Video, 6. to study own notes, 7. to make photocopies, 8. to meet friends（Figure 8）.

All of the students in the four groups gave priority "to borrow books" available in the library. Among Group I students, 51%（26）selected "to read periodicals" as the second most important reason for their library visit, whilst 41%（21）visited the library "to use PC/Audio & Videos" as the third reason. References in the library were also a fourth factor to 39%（20）of the users of Group I. In addition, 37%（19）of them visited the library "to check e-mails" and 29%（15）"to study own notes."
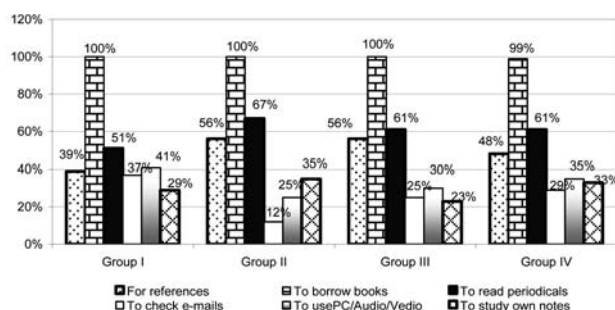

Figure 8　Purposes of Library Visits by Each Groups

Group II and Group III used libraries in a similar fashion to the Group I users. However, 35%（20）of Group II users used the library "to study own notes" as the fourth reason, whilst 25%（14）of them gave "to use PC/Audio & Videos" as their fifth priority. Twelve percent（7）of them rarely visited the library "to check e-mails."

The fourth priority of the students of Group III was 30%（17）"to use PC/Audio &Videos" available in the library, whilst 25%（14）visited "to check e-mails" and 23%（13）"to study own notes".

The pattern of library use was also similar among the users of Group IV and they gave "to use PC/Audio & Videos" 35%（31）and "to study own notes" 33%（29）in the library as their fourth and fifth priorities, respectively. There were no statistical differences between the four groups' purposes in visiting the library except for checking e mails.

Medical Students

All of the users in Group I visited the library "to borrow

books" as their first reason for visiting the library. Fifty-seven percent（12）gave as their second purpose "to read periodicals," and 52%（11）gave "for reference" as their third purpose, whilst a considerable number of users（43% [9]）gave "to use PC/Audio & Videos" in the library as a fourth reason too. Group II also showed similar purposes, but 37%（11）of them gave "to study own notes" rather than "to use PC/Audio & Videos" available in the library.

Group III priorities in order of importance were 100%（47）"to borrow books," 70%（33）"to read periodicals," and 53%（25）"for references." They occasionally used the library for other purposes, such as "to check e-mail," "to use PC/Audio & Videos," （rather than studying their notes, as the Group II and Group IV users did）. All students in Group IV also gave as their priority "to borrow books," and 70%（21）gave "to read periodicals" and 53%（16）gave "for references" as their first three purposes.

Art Students

All students in Group I used the library mainly "to borrow books," 47%（14）"to read periodicals," 47%（14）"to check e-mails," 40%（12）"to use PC/Audio & Videos," and 33%（10）"to study own notes." But the least important reason for visiting the library among 30%（9）of the students of Group I was "for references." Sixty-three percent（17）of Group II used the library "to read periodicals," and 56%（15）gave "for references" as their second and third reasons. Seventy percent（7）of Group III used the library "for references" as the second purpose like most other groups, but in particular, 50%（5）of them gave "to use PC/Audio & Videos " in the library, which was more than any other groups. Of the users of Group IV, 98%（58）visited the library "to borrow books," 56%（33）"to read periodicals," 46%（27）"for references,",41%（24）"to use PC/Audio & Videos," 36%（21）"to check e-mails," and 31%（18）"to study own notes". Students did not select "to take photocopies" or "to meet friends" as their purpose for visiting the library.

As shown in Table 5, there were significant differences between the medical and art students regarding the use of periodicals and checking e-mail. Other purposes were identical.

Table 5　Significance of the Library Use among the Four Groups, between Subjects, and Groups within Subjects

Purposes of Library Visits	Significance-among Four Groups	Significance between Subjects	Significance-within Medical Science	Significance-within Art Subjects
For references	p=.241	p=.129	p=.989	p=.094
To borrow books	p=.602	p=.496	–	p=.766
To read periodicals	p=.416	p=.008　　**	p=.717	p=.107
To check e-mails	p=.024　　*	p=.006　　**	p=.455	p=.080
To use PC/Audio/Video	p=.286	p=.077	p=.426	p=.296
To study own notes	p=.499	p=.467	p=.451	p=.869

- indicates unavailable by indifferences

4．Discussion

Universities try to provide better library service to students, but it is difficult to evaluate to what extent students have had a comfortable experience in utilizing the service. This study examined how students use the library system and services as regards looking for the information they need. To identify their understanding, we surveyed students about twelve information incidents relating to their knowledge and skills in the use of a library.

This study found that students did not make full use of libraries for their own information needs and use requirements due to insufficient knowledge and skills. The results clarified the effects of cognition which makes different patterns of library use and confirmed the positions of the users in libraries which are very important in the user education program as well as to improve the library system and promote its strength.

Four different groups were revealed by cluster analysis on the basis of the results of factor scores of four factors, which showed different patterns in library use. The findings, however, reflected general opinions about the user behaviors in library use within two discipline areas and academic years. Four groups of students reported different patterns with the certain factors in the process of library use. In particular, 22% (57) of students who represented Group II showed a positive relation with the four factors. But the significant feature found was that 77% (197) of students in the other three groups showed their negative concerns regarding some factors when using libraries.

The results showed that the students' basic knowledge and skills elements in library use were not identical. Method of Locating & Searching, Use of Materials & Services, Searching Needs, and Own Competence are the common factors related to the process of library use that interrelate with the twelve independent variables of this study. This demonstrates how students' awareness of these factors can have an impact on their library use. This suggests that the impact of the ultimate concern of the user in the process of library use should be considered.

Moreover, four different groups of students in library use showed different concerns regarding the factors affecting the library use. Group I indicated a higher concern with one positive and three negative factors. The students in that group were more highly concerned with the factors of Use of Materials & Services than were any other groups in this study. They were prevented from Own Competency, Method of Locating & Searching, Searching Needs as well. This group might be identified as "Users with technical concern."

Group II showed positive concern towards all factors. Their positive concern with Searching Needs, Method of Locating & Searching, and Use of Materials & Services, which is required for a successful use of a library, might have increased their efforts. Although the lower display of Own Competency was noticeably less than in user group III, and Use of Materials & Services also indicated lower impact compared with Group I, they might not have minded about their lower competency and were quite confident about using library services independently. They behaved expertly in the library with these deeply positive attitudes and might be identified as "Positive-active users."

Group III was highly concerned in terms of their Own Competency but showed negative concerns regarding the other factors. We identified them as "Users in the beginning stage" since the majority of them came from the first academic year. Factors of Method of Locating & Searching, Use of Materials & Services, and Searching Needs greatly hindered them in the search process.

The characteristics of Group IV also showed different patterns. The only positive factor for them was Method of Locating & Searching. Use of Materials & Services, Searching Needs, and Own Competence did not influence

them. This group's attitude was that of "Demanding results" in the search process.

However, substantial differences were noted between the two subject areas. The lack of knowledge and skills about the library system was the overwhelming drawback among 82% (47) of the medical students in group III, which was fewer than the 18% (10) of art students. There was another difference in Group IV too. Art students were more affected (66% [59]) by insufficiency of cognition than were medical students (34% [30]). The other two groups represented a similar number of students but showed statistical significant differences among the four groups in the process of library use.

On the basis of the investigated students' attitude in the cognitive searching process, we found that student groups were not identical and have different patterns in using the library. We also learned that there were significant differences at the deeper level in the information search process depending on the subjects (medicine and art). However, we found that there were no significant differences among those groups in their frequency and purposes of library visits despite their being affected by cognition.

5．Conclusion

When identifying students' efforts for using libraries comfortably, the university library faces a number of challenges in its user education programs. In this respect, the knowledge and skills of the users have been investigated by this study. The findings revealed that students have their own patterns of library use. The majority of them faced some difficulties and did not make full use of libraries due to the different levels of concern on the four factors affecting the search process.

Medical and art students showed obvious patterns of library use. The majority of students with limited knowledge and skills received poor outcomes in both discipline area from the same library setting and faced challenges in searching for information due to insufficient cognition. This study suggests that whilst offering different ways of services depending on students' levels of knowledge and skill is essential, so is improving library searching skills, designing the services according to the users' patterns of library use so that will become as self-sufficient as pos-

sible in finding their information.

Our study represents a step towards understanding students' library use patterns in terms of knowledge and skills. Further studies are needed to investigate students' searching patterns with special attention to psychological affections such as students' anxiety and efficacy of library use. Identification of such patterns is a prerequisite for the development of libraries.

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